15-DAY EXPRESS TERMS FOR PROPOSED BUILDING STANDARDS OF THE CALIFORNIA STATE LANDS COMMISSION

REGARDING PROPOSED CHANGES TO THE CALIFORNIA BUILDING CODE CALIFORNIA CODE OF REGULATIONS, TITLE 24, PART 2, CHAPTER 31F – MARINE OIL TERMINALS

2016 CALIFORNIA BUILDING CODE TRIENNIAL CODE CYCLE

(The State agency shall draft the regulations in plain, straightforward language, avoiding technical terms as much as possible and using a coherent and easily readable style. The agency shall draft the regulation in plain English. A notation shall follow the express terms of each regulation listing the specific statutes authorizing the adoption and listing specific statutes being implemented, interpreted, or made specific. (PART 1 – ADMINISTRATIVE CODE)

Legend for Express Terms:

1. **Existing California amendment:** California 45-Day language will appear in underlined and ~~strikeout~~.
2. **Amended, or repealed language**: Amended or repealed 15-Day language will appear in *italics and double underline* and ~~double strikeout~~.
3. **Rationale:** The justification for the change is shown after each section or series of related changes.
4. **Notation**: Authority and reference citations are provided at the end of each chapter.

15-DAY EXPRESS TERMS

[Note: These Express Terms have been assigned item numbers where the first number represents the Division (e.g. "1.1." for Division "1", Item "1").]

DIVISION 1
SECTION 3101F [SLC]
INTRODUCTION

1.5. ***3101F.6 Oil spill exposure classification*** ~~***5 Risk reduction strategies.***~~ *Each MOT shall be categorized into one of three oil spill exposure classifications (high, medium or low) as shown in Table 31F-1-1, based on all of the following:*

1. Exposed total volume of oil (V_T) during transfer.

2. Maximum number of oil transfer operations per berthing system (defined in Section 3102F.1.3) per year.

3. Maximum vessel size (DWT capacity) that may call at the MOT.

During a pipeline leak, a quantity of oil is assumed to spill at the maximum cargo flow rate until the ESD is fully effective. The total volume (V_T) of potential exposed oil is equal to the sum of the stored and flowing volumes (V_S + V_F) at the MOT, prior to the emergency shutdown (ESD) system(s) stopping the flow of oil. All potential spill scenarios shall be evaluated and the governing *scenario clearly identified. The stored volume (V_S) is the non-flowing oil. The flowing volume (V_F) shall be calculated as follows:*

$$V_F = Q_C \times \Delta t \times (1/3{,}600) \qquad (1\text{-}1)$$

where

V_F = Flowing Volume [bbl]

Q_C = Maximum Cargo Transfer Rate [bbl/hr]

Δt = For MOTs that first transferred oil on or before January 1, 2017, Δt may be taken as (ESD time, 30 or 60 seconds). For MOTs that first transfer oil after January 1, 2017, Δt shall be taken as ((ESD closure time) + (time required to activate ESD)) [seconds].

If spill ~~Risk~~ reduction strategies~~, such as~~ (e.g. pipeline segmentation devices, system flexibility and spill containment devices) are adopted, such that the maximum volume of exposed oil during transfer is less than 1,200 barrels, the spill classification of the facility may be lowered. ~~may be used to reduce the size of a potential oil spill. Such strategies may reduce the MOT risk classification as determined from Table 31F-4-1.~~

This classification does not apply to marine terminals that transfer LNG.

Rationale: Based on public comment, the Commission staff became aware of a typographical error in marking this section number, which is corrected by underlining the "*6*" and adding a "*5*" with strikethrough. The Commission staff was also made aware of concerns regarding the applicability of the corrected "Δt" equation to existing MOTs. To eliminate all such concerns, the Commission staff reinstated the existing code terminology "*During a pipeline leak, a quantity of oil is assumed to spill at the maximum cargo flow rate until the ESD is fully effective.*" and definition of "Δt", and provided definitive language to distinguish existing vs. new MOTs. The terminology "*[seconds]*" is also added to the definition of "Δt" to clarify the units of measurement. These amendments are consistent with the original intent and Initial Statement of Reasons for this section and code. Therefore, these amendments are sufficiently related and non-substantive.

1.7. ***3101F.7 Management of Change.*** *Whenever physical changes are made to the built MOT that significantly impact operations, a Management of Change (MOC) process shall be followed per Section 6.6 of API Standard 2610 [1.4].*

Rationale: Based on public comment, the proposed language is amended to clarify that a MOC process shall be followed when physical change(s) are made to the MOT that significantly impact operations. This amendment is sufficiently related and non-substantive.

1.9. ***3101F.8~~6~~.1 Quality assurance.*** *All audits, inspections, engineering analyses or designs shall be reviewed by a professional having similar or higher qualifications as the person who performed the work, to ensure quality assurance. This review may be performed in-house, and~~. The operator~~ shall include ~~provide~~ a concluding statement of compliance with this code~~, as certified by the engineer-of-record~~.*

~~Peer review is required for nonlinear dynamic structural analyses and alternative lateral force procedures not prescribed herein. The peer review may be from an independent internal or external source. The peer reviewer shall be a California registered civil or structural engineer.~~

Rationale: Based on public comment, the proposed language is modified to eliminate confusion as to who provides "*a concluding statement of compliance with this code*". Since standards already require MOT operators to submit their code-compliance documentation and all engineering documents to be certified by the engineer-of-record, this terminology is removed to reduce redundancy. These amendments are sufficiently related and non-substantive.

1.10. ***3101F.8.2 Peer review.*** *The Division may require peer review of advanced engineering analyses and designs, including, but not limited to, nonlinear dynamic structural analyses, alternative lateral force procedures, complex geotechnical evaluations, subsea pipeline analyses and designs, and fatigue analyses. Peer review shall be performed by an external independent source to maintain the integrity of the process.*

The peer reviewer(s) and their affiliated organization shall have no other involvement in the project, except in a review capacity. The peer reviewer(s) shall be a California registered engineer(s) familiar with regulations governing the work and have technical expertise in the subject matter to a degree of at least that needed for the original work. The peer reviewer(s)' credentials shall be presented to the Division for approval prior to commencement of the review.

Upon completion of the review process, the peer reviewer(s) shall submit a written report directly to the Division that covers all aspects of the review process, including, but not limited to:

1. *Scope, extent and limitations of the review.*
2. *Status of the documents reviewed at each stage (i.e. revision number and date).*
3. *Findings.*
4. *Recommended corrective actions and resolutions, if necessary.*
5. *Conclusions.*
6. *Certification by the peer reviewer(s), including~~ (i.e. as to~~ whether or not the final reviewed work meets the requirements of this code~~)~~.*
7. *Formal documentation of important peer review correspondence, including~~ such as~~ requests for information and~~,~~ written responses~~, telephone and meeting logs, etc~~.*

The owner and operator shall cooperate in the review process, but shall not influence the peer review. If the original work requires modification after completion of the peer review, the final analyses and designs shall be submitted to the Division.

Rationale: Based on public comment, the proposed language is modified for clarity. Item #6 is reworded, including the insertion of "*reviewed*", to articulate that the peer reviewer is not the originator of the final work and is only acting in a review capacity. Item #7 is reworded to clarify that only "*important*" documentation is required. These amendments are sufficiently related and non-substantive.

Notation
Authority: Sections 8750 through 8760, Public Resources Code.
References: Sections 8750, 8751, 8755 and 8757, Public Resources Code. Section 8670.28(a)(7), Government Code.

DIVISION 2
SECTION 3102F
AUDIT AND INSPECTION

2.6. ***3102F.3.3.2 Subsequent audits.*** *A subsequent audit ~~report~~ of each terminal shall be completed ~~at a maximum interval of 4 years, and~~ <u>concurrently with the</u> ~~includes documentation of~~ inspections <u>(see Section 3102F.3.5)</u>. ~~This interval may be reduced, based on the recommendation of the audit team leader, and with the approval of the Division, depending on the extent and rate of deterioration or other factors.~~ <u>The audit team leader shall</u> ~~may~~ recommend <u>either: (1) a default subsequent audit interval of 4 years, or (2) an alternate</u> ~~change in the subsequent audit~~ <u>interval, based on assessments of the structural, mechanical and electrical systems, and consideration of:</u>*

<u>1. The extent of the latest deterioration and/or disrepair,</u>

<u>2. The rate of future anticipated deterioration and/or disrepair,</u>

<u>3. The underwater inspection guidance provided in Table 31F-2-1, and</u>

<u>4. Other specified factors.</u>

<u>Based on independent assessment of these factors, the Division may accept the audit team leader's recommendation or require a different subsequent audit interval.</u>

~~The maximum interval for above water inspections shall be 4 years. The maximum interval for underwater inspections is dependent upon the condition of the facility, the construction material type and/or the environment at the mudline, as shown in Table 31F-2-1.~~

If there are no changes in the defined purpose (see Section 3102F.3.6.1) of the berthing system(s), <u>relevant prior analyses</u> ~~then analyses from previous audits~~ may be referenced. However, if there is a significant change in <u>the operations or condition of</u> ~~a~~ berthing system(s), ~~or when deterioration or damage must be considered,~~ a new analysis may be required.

The Division may require an audit, inspection<u>s</u> or supplemental evaluations to justify changes in the use of the berthing system(s).

Rationale: Based on public comment, the proposed language regarding subsequent audit timing is revised to provide clarity. Reference to the existing Section 3102F.3.5 is added to clarify the *Scope of inspections* are to be completed concurrently with the audits. The rewording also more logically groups the two (2) methods available for determining audit time intervals into a single sentence. And the term "*maximum*" is replaced with "*default*" to better articulate intent. These amendments are sufficiently related and non-substantive.

2.12a. ***3102F.3.5.<u>2</u>~~3~~ Special inspection considerations.***

Rationale: During the 45-day public comment period, the Commission staff discovered an error in the Section 3102F.3.5.X numbering sequence. This Express Term is added to address this mistake. This amendment is sufficiently related and non-substantive.

2.13. ***3102F.3.5.3~~4~~ Mechanical and electrical inspections.*** *…*

…

Utility, auxiliary and fire protection piping shall have external visual inspections, similar to that defined in Section 10.1 of API RP 574 [2.3] (N/E).

Rationale: During the 45-day public comment period, the Commission staff discovered an error in the Section 3102F.3.5.X numbering sequence. This amendment is sufficiently related and non-substantive.

2.14. ***3102F.3.5.4~~5~~ Corrosion inspection.***

During each audit, a comprehensive corrosion inspection shall be performed by a qualified engineer or technician. This inspection shall include all steel and metallic components, and any installed cathodic protection system (CPS). CPS inspection during the audit is not intended to substitute for required testing and maintenance performed on a more frequent schedule per Section 3111F.10. All inspection results shall be documented, and shall be used in the corrosion assessment (Section 3102F.3.6.5).

Submerged wharf structures and associated cathodic protection equipment (if installed) shall be inspected per [2.2]. Above water structures, ancillary equipment, supports, and hardware shall be visually inspected. Corrosion inspection of utility, auxiliary and fire pipelines shall be done per Section 3102F.3.5.4 ~~API RP 574 [2.3]~~.

For oil pipelines in an API 570 [2.4] inspection program, a corrosion inspection is not required as part of the audit; however, the latest inspection results, calculations, and conclusions shall be reviewed, and any significant results shall be included in the corrosion assessment.

Rationale: During the 45-day public comment period, the Commission staff discovered an error in the Section 3102F.3.5.X numbering sequence.

Furthermore, based on public comment, the proposed language is amended by replacing the "*API RP 574 [2.3]*" reference with the "*Section 3102F.3.5.4*" reference, to clarify that the utility, auxiliary and fire piping/pipelines inspections completed in accordance with the Section 3102F.3.5.4 may also satisfy the corrosion inspection requirements and a redundant inspection is not required.

These amendments are sufficiently related and non-substantive.

2.17. ***3102F.3.9 Action plan implementation between audits ~~report~~.*** *The operator is responsible for correction of deficiencies between audits. Prior to implementation, projects shall be submitted for Division review in accordance with Section 3101F.8.3. During project implementation, the Division shall be informed of any significant changes. After project completion, "as-built" documentation, including drawings, calculations and analyses, shall be submitted to the Division.* ~~*After implementation of remedial measures, a report shall be submitted to the Division and shall include:*~~

~~*1. A description of each action taken*~~

~~*2. Updated Executive Summary Tables*~~

~~*3. Supporting documentation with calculations and/or relevant data*~~

Executive Summary Tables shall be updated by the operator and submitted to the Division at least annually.

[Note: Double underline of last sentence denotes proposed language which would be underlined in code.]

Rationale: Based on public comment, the proposed language is amended to reference Section 3101F.8.3 *Division Review*, to clarify that such submission requirements are limited to those projects which meet the *Division Review* standards. This amendment is sufficiently related and non-substantive.

Notation
Authority: Sections 8750 through 8760, Public Resources Code.
References: Sections 8750, 8751, 8755 and 8757, Public Resources Code.

DIVISION 3
SECTION 3103F
STRUCTURAL LOADING CRITERIA

3.20. 3*103F.5.2.1.2 Survival condition.* *…*

… If the wind rises above these levels, the vessel must depart the berth; it shall be able to depart within 30 minutes (see 2 CCR 2340 ~~(c) (28)~~) [3.4]~~[3.10]~~.

… If other duration wind data is available, it shall be adjusted to a 30-second duration, in accordance with Equation (3-12)~~(3.12)~~. The 25-year return period shall be used to establish the design wind speed for each direction. In order to simplify the analysis for barges (or other small vessels), they may be considered to be solid free-standing walls (Chapter 29 ~~6~~ of ASCE/SEI 7 [3.5]~~[3.11]~~). …

Rationale: Based on public comment, the ASCE/SEI 7 [3.5] reference is updated from "*Chapter 6*" to "*Chapter 29*", for consistency with the reorganization of sections/chapters which occurred in the latest (2010) revision of the ASCE/SEI 7 standard. This amendment is sufficiently related and non-substantive.

3.28. *3103F.5.4 Wave loads.* *When the significant wave period, T_S ~~Ts~~, is greater than 4 seconds ~~sections~~ (s~~S~~ee Section 3105F.3.1), …*

… The Froude-Krylov method discussed in Chakrabarti's Chapter 7 [3.11][3.18] may be used to calculate the wave excitation forces, …

Rationale: During the 45-day public comment period, the Commission staff discovered a typographical error in this Express Term and corrected "*sections*" to "*seconds*". Note that the proposed language shown in the Initial Statement of Reasons document did not contain this error. This amendment is sufficiently related and non-substantive.

3.44. *3103F.8.2 Live load (L).* *~~While The~~ Typically, the live load on ~~typical~~ MOTs is ~~typically~~ small and may be ~~is therefore~~ neglected for combinations including earthquake loads~~,~~. However, in some cases, a higher value of live load may be warranted ~~in some cases~~ depending on MOT use, and an appropriate value of live load shall be considered for combinations including earthquake loads.*

Rationale: Based on public comment, the proposed language regarding live load considerations is modified for clarity. This amendment is sufficiently related and non-substantive.

Notation
Authority: Sections 8750 through 8760, Public Resources Code.
References: Sections 8750, 8751, 8755 and 8757, Public Resources Code.

DIVISION 4
SECTION 3104F
SEISMIC ANALYSIS AND STRUCTURAL PERFORMANCE

4.6 ***3104F.2.1 Design earthquake motions.*** *Two levels of design seismic performance shall be considered. These levels are defined as follows:*

Level 1 Seismic performance:

- *Minor or no structural damage*
- *Temporary or no interruption in operations*

Level 2 Seismic performance:

- *Controlled inelastic structural behavior with repairable damage*
- *Prevention of structural collapse*
- *Temporary loss of operations, restorable within months*
- *Prevention of major spill (≥ 1200 bbls) ~~(≥ 1200 bbls)~~*

Rationale: Based on public comment, the existing code language is reinstated.

4.8. ***3104F.2.3 Analytical procedures.*** *The objective of the seismic analysis is to verify that the displacement capacity of the structure is greater than the displacement demand, for each performance level defined in Table 31F-4-1 ~~31F-4-2~~. For this purpose, the displacement capacity of each element of the structure shall be checked against its displacement demand including the orthogonal effects of Section 3104F.4.2. The required analytical procedures are summarized in Table 31F-4-2 ~~31F-4-3~~.*

The displacement capacity of the structure shall be calculated using the nonlinear static (pushover) procedure. For the nonlinear static (pushover) procedure, the pushover load shall be applied at the target node defined as the center of mass (CM) of the MOT structure. It is also acceptable to use a nonlinear dynamic procedure for capacity evaluation, subject to peer review in accordance with Section 3101F.8.2.

Methods used to calculate the displacement demand are linear modal, nonlinear static and nonlinear dynamic.

Mass to be included in the displacement demand calculation shall include mass from self-weight of the structure, weight of the permanent equipment, and portion of the live load that may contribute to inertial mass during earthquake loading, such as a minimum of 25% of the floor live load in areas used for storage.

Any rational method, subject to the Division's approval, can be used in lieu of the required analytical procedures shown in Table 31F-4-2 ~~31F-4-3~~.

Rationale: Based on public comment, the proposed language regarding "*portion of the live load that may contribute to inertial mass during earthquake loading*" is enhanced with the addition of an example of live load which may be considered. Ultimately, such live load considerations shall be based on sound engineering judgement. This amendment is sufficiently related and non-substantive.

4.18. ***3104F.2.3.2.1 Coefficient Method.*** *The Coefficient Method is based on the ASCE/SEI 41 [4.3]* *procedure.*

The first step in the Coefficient Method requires idealization of the pushover curve to calculate the effective elastic lateral stiffness, k_e, and effective yield strength, F_y, of the structure as shown in Figure 31F-4-4.

The first line segment of the idealized pushover curve shall begin at the origin and have a slope equal to the effective elastic lateral stiffness, k_e. The effective elastic lateral stiffness, k_e, shall be taken as the secant stiffness calculated at the lateral force equal to 60 percent of the effective yield strength, F_y, of the structure. The effective yield strength, F_y, shall not be taken as greater than the maximum lateral force at any point along the pushover curve.

The second line segment shall represent the positive post-yield slope ($\alpha_1 k_e$) determined by a point (F_d, Δ_d) and a point at the intersection with the first line segment such that the area above and below the actual curve area approximately balanced. (F_d, Δ_d) shall be a point on the actual pushover curve at the calculated target displacement, or at the displacement corresponding to the maximum lateral force, whichever is smaller.

The third line segment shall represent the negative post-yield slope ($\alpha_2 k_e$), determined by the point at the end of the positive post-yield slope (F_d, Δ_d) and the point at which the lateral force degrades to 60 percent of the effective yield strength.

The target displacement shall be calculated from:

$$\Delta_d = C_1 C_2 S_A \frac{T_e^2}{4\pi^2} \qquad (4\text{-}1)$$

where:

S_A = *spectral acceleration of the linear-elastic system at vibration period, which is computed from:*

$$T_e = 2\pi\sqrt{\frac{m}{k_e}} \qquad (4\text{-}2)$$

where:

m = *seismic mass as defined in Section 3104F.2.3*

k_e = *effective elastic lateral stiffness from idealized pushover*

C_1 = *modification factor to relate maximum inelastic displacement to displacement calculated for linear elastic response. For period less than 0.2 s, C_1 need not be taken greater than the value at T_e = 0.2 s. For period greater than 1.0 s, C_1 = 1.0. For all other periods:*

$$C_1 = 1 + \frac{\mu_{strength} - 1}{aT_e^2} \qquad (4\text{-}3)$$

where:

a = *Site class factor*

= 130 for Site Class A or B,

= 90 for Site Class C, and

= 60 for Site Class D, E, or F.

$\mu_{strength}$ = ratio of elastic strength demand to yield strength coefficient calculated in accordance with Equation (4-5). The Coefficient Method is not applicable where $\mu_{strength}$ exceeds $\mu_{\max}$ computed from Equation (4-6).

C_2 = modification factor to represent the effects of pinched hysteresis shape, cyclic stiffness degradation, and strength deterioration on the maximum displacement response. For periods greater than 0.7s, C_2 =1.0. For all other periods:

$$C_2 = 1 + \frac{1}{800}\left(\frac{\mu_{strength} - 1}{T_e}\right)^2 \qquad (4\text{-}4)$$

The strength ratio $\mu_{strength}$ shall be computed from:

$$\mu_{strength} = \frac{mS_A}{F_y} \qquad (4\text{-}5)$$

where:

F_y = yield strength of the structure in the direction under consideration from the idealized pushover curve.

For structures with negative post-yield stiffness, the maximum strength ratio $\mu_{\max}$ shall be computed from:

$$\mu_{\max} = \frac{\Delta_d}{\Delta_y}\frac{\left|\alpha_e\right|^{-h}}{4} \qquad (4\text{-}6)$$

where:

Δ_d = larger of target displacement or displacement corresponding to the maximum pushover force,

Δ_y = displacement at effective yield strength,

$h = 1 + 0.15\ln T_e$, and

α_e = effective ~~Effective~~ negative post-yield slope ratio which shall be computed from:

$$\alpha_e = \alpha_{P-\Delta} + \lambda\left(\alpha_2 - \alpha_{P-\Delta}\right) \qquad (4\text{-}7)$$

where:

$\alpha_{P-\Delta}$, and the maximum negative post-elastic stiffness ratio, α_2, are estimated from the idealized force-deformation curve, and λ is a near-field effect factor equal to 0.8 for sites with 1 second spectral value, S_1 greater than or equal to 0.6g and equal to 0.2 for sites with 1 second spectral value, S_1 less than 0.6g.

Rationale: Based on public comment which requested clarification of the definition of "k_e" in Section 3104F.2.3.2.2 *Substitute Structure Method* (i.e. Express Term #4.23), the Commission staff determined it prudent to better articulate similar terminology utilized in Section 3104F.2.3.2.1 *Coefficient Method*. Therefore, the terminology "*effective elastic*" is enhanced in four (4) locations and the symbol "k_e" added in one (1) location (with associated grammatical modifications) to eliminate any potential for confusion between effective elastic lateral stiffness ("k_e") and effective secant lateral stiffness ("k_{eff}"). And the symbol "F_y" is similarly added in two (2) locations to eliminate any potential for confusion.

Furthermore, during the 45-day public comment period, the Commission staff discovered two (2) typographical errors which are corrected, including modification of "*systems*" to "*system's*" below item #5 and "*Effective" to* "*effective" under Equation (4-6)*.

These amendments are sufficiently related and non-substantive.

4.23. ~~***3104F.2.3.2.5 Refined analyses.*** *Refined displacement demand analyses may be calculated as per Chapters 4 and 5 of [4.1] and is briefly summarized below.*~~

3104F.2.3.2.2 Substitute Structure Method. *The Substitute Structure Method is based on the procedure presented in Priestley et al. [4.4] and is briefly summarized below.*

1. *Idealize the pushover curve from nonlinear pushover analysis, as described in Section 3104F.2.3.2.1, and estimate the yield force, F_y, and yield displacement, Δ_y.*
2. *Compute the effective elastic lateral stiffness, k_e, as the yield force, F_y, divided by the yield displacement, Δ_y.*
3. *Compute the structural period in the direction under consideration from:*

$$T_e = 2\pi\sqrt{\frac{m}{k_e}} \qquad \text{(4-8)}$$

where:

m = seismic mass as defined in Section 3104F.2.3

k_e = effective elastic lateral stiffness in direction under consideration

4~~1~~. Determine target displacement, Δ_d, from: ~~Section 3104F.2.3.2.3.~~

$$\Delta_d = S_A \frac{T_e^2}{4\pi^2} \qquad \text{(4-9)}$$

where:

S_A = spectral displacement corresponding to structural period, T_e

~~*2. From the nonlinear pushover analysis, determine the structural yield displacement Δ_y.*~~

5~~3~~. The ductility level, μ_Δ, is found from Δ_d/Δ_y. Use the appropriate relationship between ductility *and damping, for the component undergoing inelastic deformation, to estimate the effective structural damping, ξ_{eff}. In lieu of more detailed analysis, the relationship shown in Figure 31F-4-5 ~~31F-4-3~~ or Equation (4-10) ~~equation (4-3)~~ may be used for concrete and steel piles connected to the deck through dowels embedded in the concrete.*

$$\xi_{eff} = 0.05 + \frac{1}{\pi}\left(1 - \frac{1-r}{\sqrt{\mu_\Delta}} - r\sqrt{\mu_\Delta}\right) \qquad \text{(4-10)}~~\text{(4-3)}~~$$

where:

r = ratio of second slope over elastic slope (see Figure 31F-4-7 ~~31F-4-5~~)

Equation (4-10) for effective damping was developed by Kowalsky et al. [4.5] for the Takeda hysteresis model of system's ~~systems~~ force-displacement relationship.

6~~4~~. From the acceleration response spectra, create elastic displacement spectra, S_D, using Equation (4-11) ~~equation (4-4)~~ for various levels of damping.

$$S_D = \frac{T^2}{4\pi^2} S_A \qquad \text{(4-11)}~~\text{(4-4)}~~$$

7~~5~~. Using the curve applicable to the effective structural damping, ξ_{eff}, ~~ξ,~~ find the effective period, T_d (see Figure 31F-4-6 ~~31F-4-4~~).

8~~6~~. In order to convert from a design displacement response spectra to another spectra for a different damping level, the adjustment factors in Section 3103F.4.2.9 shall be used.

9~~7~~. The effective secant stiffness, k_{eff}, ~~k_e,~~ can then be found from:

$$k_{eff} = \frac{4\pi^2}{T_d^2} m \qquad \text{(4-12)}$$

$$\cancel{k_e = \frac{4\pi^2}{T_d^2} M} \qquad \cancel{\text{(4-5)}}$$

where:

m = seismic mass as defined in Section 3104F.2.3

~~M= mass of deck considered in the analysis.~~

T_d = effective structural period

10~~8~~. The required strength, F_u, can now be estimated by:

$$F_u = k_{eff}\Delta_d \qquad \text{(4-13)}~~\text{(4-6)}~~$$

11~~9~~. F_u and Δ_d can be plotted on the force-displacement curve established by the pushover analysis. Since this is an iterative process, the intersection of F_u and Δ_d most likely will not fall on the force-displacement curve and a second iteration will be required. An adjusted value of Δ_d, taken as the intersection between the force-displacement curve and a line between the origin and F_u and Δ_d, can be used to find μ_Δ.

12~~10~~. Repeat the process until a satisfactory solution is obtained (see Figure 31F-4-7 ~~31F-4-5~~).

13. *From pushover data, calculate the displacement components of an element along the two axis of the system.*

Rationale: Based on public comment, the terms "*effective elastic*" are added to the definition of "k_e" in items #2 and #3 (below *Equation (4-8)*) to clearly distinguish between effective elastic lateral stiffness ("k_e") and effective secant lateral stiffness ("k_{eff}").

Furthermore, during the 45-day public comment period, the Commission staff discovered five (5) typographical errors which are corrected, including three (3) missing commas in items #1, one (1) missing comma in item #4, and the improvement of "*systems*" to "*system's*" below item #5.

These amendments are sufficiently related and non-substantive.

4.27. Add new Figure 31F-4-7:

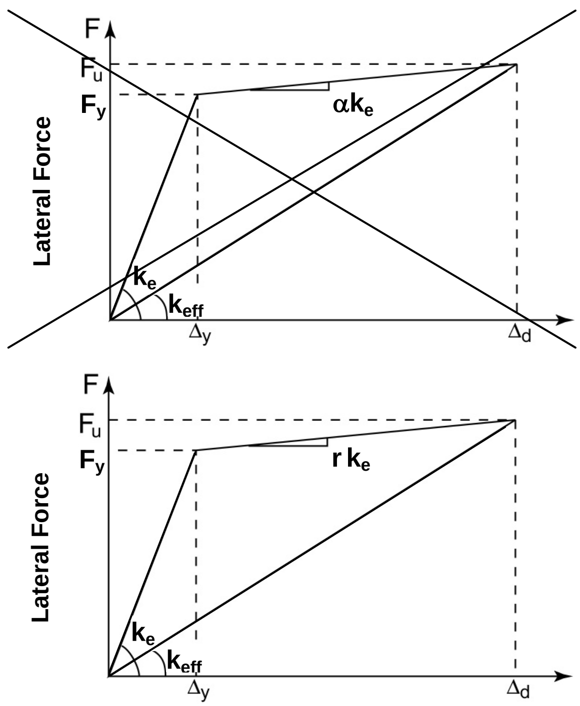

FIGURE 31F-4-7
EFFECTIVE LATERAL STIFFNESS (ADAPTED FROM [4.4])

Rationale: Based on public comment, "α" is corrected to "r" for consistency with the symbolism utilized in Section 3104F.2.3.2.2 (i.e. Express Term #4.23) and Figure 31F-4-5 (i.e. Express Term #4.24).

Furthermore, based on public comment, the term "*EFFECTIVE*" has been added to the figure title for consistency with the effective elastic lateral stiffness ("k_e") and effective secant lateral stiffness ("k_{eff}") terminology in Section 3104F.2.3.2.2 *Substitute Structure Method* (i.e. Express Term #4.23).

These amendments are sufficiently related and non-substantive.

4.42. *3104F.7~~6~~ Symbols.*

a	=	*Site class factor*
C_1	=	*Modification factor to relate expected maximum inelastic displacement to displacement calculated for linear elastic response*
C_2	=	*Modification factor to represent the effects of pinched hysteresis shape, cyclic stiffness degradation and strength deterioration on the maximum displacement response*
e	=	…
~~$E_{inertial}$~~	=	~~*Inertial seismic load*~~
F_u	=	…
F_y	=	*Effective yield strength*
H	=	…
~~H_d~~	=	~~*Foundation deformation load*~~
~~k~~	=	~~*Stiffness in direction under consideration in k/ft*~~
k_e	=	*Effective elastic lateral stiffness*
k_{eff}	=	*Effective secant lateral stiffness*
L_l	=	…
m	=	*Seismic mass* ~~*Mass of structure in kips/g*~~
~~M~~	=	~~*Mass of deck considered in the analysis*~~
r	=	…
S_A	=	*Spectral response acceleration*~~,~~ *at T*
S_D	=	*Displacement response spectrum*~~,~~ *at T*
~~S_{ap}~~	=	~~*Spectral response acceleration of pipeline segment under consideration*~~
S_1	=	*1-second spectral response acceleration*
T	=	…
T_d	=	…
T_e	=	*Effective elastic structural period*
V	=	…
~~V_y~~	=	~~*total base shear*~~
~~$V_{ÄT}$~~	=	~~*total segment lateral force*~~
V_{sk}	=	…
$V_{\Delta T}$	=	*Total segment lateral force*
W	=	…
~~W_p~~	=	~~*Weight of pipeline segment under consideration*~~
α_1	=	*Positive post-yield slope ratio equal to positive post-yield stiffness divided by the effective stiffness*
α_2	=	*Negative post-yield slope ratio equal to negative post-yield stiffness divided by the effective stiffness*
α_e	=	*Effective negative post-yield slope ratio equal to effective post-yield negative stiffness divided by the effective stiffness*
$\alpha_{P-\Delta}$	=	*Negative slope ratio caused by P-Δ effects*

Δ_{avg}	=	*Average of displacements, Δ_1, Δ_2, at ends of the MOT transverse to an axis*
Δ_d	=	*Target ~~Design~~ displacement ~~demand~~*
Δ_m	=	*Maximum of displacements, Δ_1 and Δ_2, at ends of the MOT transverse to an axis*
Δ_y	=	*Displacement at yield strength*
Δ_1, Δ_2	=	*Displacement at ends of the MOT transverse to an axis*
δ_d ~~Δ_x~~	=	*Design displacement demand at an element ~~Longitudinal displacement demand~~*
δ_x	=	*Displacement of an element in X direction*
δ_y	=	*Displacement of an element in Y direction*
δ_{xx} ~~Δ_{xx}~~	=	…
δ_{xy} ~~Δ_{xy}~~	=	…
~~Δ_y~~	=	~~*Transverse displacement demand*~~
δ_{yx} ~~Δ_{yx}~~	=	…
δ_{yy} ~~Δ_{yy}~~	=	…
λ	=	*Near-field effect factor*
μ_{max}	=	*Maximum strength ratio*
$\mu_{strength}$	=	*Ratio of elastic strength demand to yield strength*
μ_{Δ}	=	…
ξ_{eff} or ξ	=	…

Rationale: Based on public comment, the term "*elastic*" has been added to the definition of "k_e" to clearly distinguish between effective elastic lateral stiffness ("k_e") and effective secant lateral stiffness ("k_{eff}"), and for consistency between terminology and symbolism in Section 3104F.2.3.2.1 *Coefficient Method* (i.e. Express Term #4.18) and Section 3104F.2.3.2.2 *Substitute Structure Method* (i.e. Express Term #4.23).

Furthermore, during the 45-day public comment period, the Commission staff discovered that the definition of "$\mu_{strength}$" provided in Section 3104F.7 is inconsistent with the definition provided under *Equation (4-3)* in Section 3104F.2.3.2.1 (i.e. Express Term # 4.18), and therefore, the word "*demand*" is added for consistency.

These amendments are sufficiently related and non-substantive.

Notation
Authority: Sections 8750 through 8760, Public Resources Code.
References: Sections 8750, 8751, 8755 and 8757, Public Resources Code.

DIVISION 5
SECTION 3105F
MOORING AND BERTHING ANALYSIS AND DESIGN

5.2. ***3105F.2 Mooring analyses.*** *…*

Two procedures, manual and numerical are available for performing mooring analyses. These procedures shall conform to either the OCIMF (MEG 3) ~~document, "Mooring Equipment Guidelines (MEG3)"~~ [5.4] or UFC 4-159-03 ~~4-152-03~~ ~~the Department of Defense "Moorings" document~~ [5.5]. …

…

The most severe combination of the environmental and operational conditions has to be identified for each mooring component. At a minimum, the following conditions shall be considered:

1. *…*
2. *…*
3. *…*
4. *…*
5. *The maximum allowable extension limits of the loading arms and/or hoses.*
6. *The maximum allowable compression/deflection of the fender system.*

Rationale: Based on public comment, the typographical error of "*UFC 4-152-03*" is corrected to "*UFC 4-159-03*". This amendment is sufficiently related and non-substantive.

5.10. ***3105F.6.1 Mooring analyses.*** *Analysis procedures shall conform to the OCIMF MEG3 [5.4] or UFC 4-159-03 ~~4-152-03~~ [5.5], and the following:*

1. *A mooring analysis shall be performed for the range of tanker classes and barges calling at each offshore berth.*
2. *Forces acting on moored vessels shall be determined according to Section 3103F.5 and analysis shall consider all possible vessel movements, contribution of buoys, sinkers, catenaries affecting mooring line stiffness and anchorages.*
3. *Correlation of winds, waves and currents shall be considered. The correlation may be estimated by probabilistic analysis of metocean data.*
4. *The actual expected displacement of the vessels shall be used in the analysis.*
5. *Underwater inspections and bathymetry shall be considered.*
6. *Both fully laden and ballast conditions shall be considered.*
7. *Dynamic analysis shall be used to evaluate moorings performance.*

Rationale: Based on public comment, the typographical error of "*UFC 4-152-03*" is corrected to "*UFC 4-159-03*". This amendment is sufficiently related and non-substantive.

5.11. ***3105F.6.2 Design of m~~M~~ooring c~~C~~omponents.*** *Design of mooring components shall be based on loading combinations and safety factors defined in Sections 3103F.8 through 3103F.10 and follow the guidelines provided in either the OCIMF MEG3 [5.4] or UFC 4-159-03 ~~4-152-03~~ [5.5].*

Rationale: Based on public comment, the typographical error of "*UFC 4-152-03*" is corrected to "*UFC 4-159-03*". Furthermore, during the 45-day public comment period, the Commission staff discovered a typographical error in the section title and removed the capitalization of "*mooring components*". These amendments are sufficiently related and non-substantive.

5.13. ***3105F.8~~7~~ References.***

[5.1] American Concrete Institute (ACI), 2014, ACI 318-14 (ACI 318)~~, ACI 318-05, 2005~~, "Building Code Requirements for Structural Concrete (ACI 318-14 ~~318-05~~) and Commentary (ACI 318R-14 ~~318R-05~~)," Farmington Hills, MI ~~Michigan~~.

[5.2] American Institute of Steel Construction Inc. (AISC), 2011, AISC 325-11 (AISC 325)~~, 2005~~, "Steel Construction Manual," 14th ed. ~~Thirteenth Edition~~, Chicago, IL.

[5.3] American Wood Council (AWC), 2014, ANSI/AWC NDS-2015 (ANSI/AWC NDS) ~~American Forest & Paper Association, 2005~~, "National Design Specification (NDS) for Wood Construction," ~~ANSI/ AF&PA NDS-2005,~~ Washington, D.C.

[5.4] Oil Companies International Marine Forum (OCIMF), 2008, "Mooring Equipment Guidelines (MEG3)," 3rd Ed., London, England.

[5.5] Department of Defense, 3 October 2005 (Revised 1 September 2012), Unified Facilities Criteria (UFC) 4-159-03 ~~4-152-03~~, "Design: Moorings"~~, Unified Facilities Criteria (UFC) 4-152-03~~, Washington D.C.~~, USA~~.

[5.6] Department of Defense, 12 December 2001 (Revised 19 October 2010), Unified Facilities Criteria (UFC) 4-150-06, "Military Harbors and Coastal Facilities"~~, Unified Facilities Criteria (UFC) 4-150-06~~, Washington D.C.~~, USA.~~

[5.7] Kilner F.A., 1961, "Model Tests on the Motion of Moored Ships Placed on Long Waves." Proceedings of 7th Conference on Coastal Engineering, August 1960, The Hague, Netherlands, published by the Council on Wave Research - The Engineering Foundation.

[5.8] Department of Defense, 28 July 2005 (Revised 1 September 2012), Unified Facilities Criteria (UFC) 4-152-01, "Design: Piers and Wharves," ~~Unified Facilities Criteria (UFC), 4-152-01~~, Washington D.C.~~, USA.~~

[5.9] Permanent International Association of Navigation Congresses (PIANC), 2002, "Guidelines for the Design of Fender Systems: 2002," Brussels.

~~*[5.10] British Standards Institution, 1994, "British Standard Code of Practice for Maritime Structures – Part 4. Code of Practice for Design of Fendering and Mooring Systems," BS6349, London, England.*~~

Authority: Sections 8750 through 8760 ~~8755 and 8757~~, Public Resources Code.

Reference: Sections 8750, 8751, 8755, and 8757, Public Resources Code.

Rationale: Based on public comment, the typographical error of "*UFC 4-152-03*" is corrected to "*UFC 4-159-03*". This amendment is sufficiently related and non-substantive.

Notation
Authority: Sections 8750 through 8760, Public Resources Code.
References: Sections 8750, 8751, 8755 and 8757, Public Resources Code.

DIVISION 6
SECTION 3106F
GEOTECHNICAL HAZARDS AND FOUNDATIONS

6.28. ***3106F.10.2 Kinematic loading from lateral spreading.*** *Kinematic pile loading from permanent lateral spread ground deformation in deep seated levels of slope/embankment/dike foundation soils shall be evaluated. The lateral deformations shall be restricted such that the structural performance of foundation piles is not compromised.*

The lateral deformation of the embankment or dike and associated piles and foundation soils shall be determined using analytical methods as follows:

1. *Initial estimates of free field lateral spread deformations (in the absence of piles) may be determined using the simplified Newmark sliding block method as described in Section 3106F.5.4. The geotechnical analyst shall provide the structural analyst with level-ground p-y curves for the weak soil layer controlling the lateral spread and soil layers above and below the weak layer. Appropriate overburden pressures shall be used in simplified pushover analyses, to estimate the pile displacement capacities and corresponding pile shear within the weak soil zone.*
2. *For the pushover analysis, the estimated displacements may be uniformly distributed within the thickness of the weak soil layer (i.e., zero at and below the bottom of the layer to the maximum value at and above the top of the weak layer), or as appropriate.*
3. *For a simplified analysis (see Figure 31F-6-2), the pile shall be fixed against rotation and translation relative to the soil displacement at some distance above and below the weak soil layer. Between these two points, lateral soil springs are provided, which allow deformation of the pile relative to the deformed soil profile.*
4. *The geotechnical analyst shall perform pseudo-static slope stability analysis (Section 3106F.5.2) with the "pinning" effects of piles arising from pile shear in the weak zone incorporated, and estimate the displacement demands using simplified Newmark analysis. If the estimated displacement demands are less than the displacement capacities, as defined by the structural analyst, no further analysis for kinematic loading will be necessary.*
5. *If more detailed numerical analyses are deemed necessary to provide input to the structural analyst, two-dimensional dynamic soil-structure interaction analysis of the structure-pile-dike-soil system using numerical finite element or finite difference analyses shall be performed.*
6. *Sensitivity analyses shall also be performed on factors affecting the results.*
7. *As a minimum, deformation profiles along the length of the various pile row should be provided to the structural analyst to estimate strains and stresses in the piles for the purpose of checking performance criteria. Such analyses should be coordinated with the structural analyst.*

Rationale: Based on public comment, the terminology "*or as appropriate*" is added to item #2 to clarify that geotechnical engineering judgement should be utilized to appropriately determine the distribution of kinematic motions over the soil layer. This amendment is sufficiently related and non-substantive.

Notation
Authority: Sections 8750 through 8760, Public Resources Code.
References: Sections 8750, 8751, 8755 and 8757, Public Resources Code.

DIVISION 8
SECTION 3108F
FIRE PREVENTION, DETECTION AND SUPPRESSION

8.7. ***3108F.3.2 Emergency shutdown (ESD) systems.*** *Emergency shutdown systems are essential to oil spill and fire prevention. These systems may include, but are not limited to, ESD valves, shore isolation valves (SIVs), automatic pump shutdown, controls, actuators and alarms. ~~An essential measure of fire prevention is communications in conjunction with the emergency shutdown.~~ The ESD ~~and isolation~~ systems shall conform to 2 CCR 2380 ~~(h)~~ [8.3] and 33 CFR 154.550 [8.5] ~~[8.6]. An ESD system shall include or~~, and provide:*

~~1. An ESD valve, located near the dock manifold connection or loading arm (N/E).~~

~~2. ESD valves, with "Local" and "Remote" actuation capabilities (N).~~

1~~3~~. Remote actuation stations strategically located, so that ESD valve(s) may be shut within required times (N).

2~~4~~. Multiple actuation stations installed at strategic locations, so that one such station is located more than 100 ft from areas classified as Class I, Group D, Division 1 or 2 per the California Electrical Code [8.6]~~[8.7]~~. Actuation stations shall be wired in parallel to achieve redundancy and arranged so that fire damage to one station will not disable the ESD system (N).

3~~5~~. Communications or control circuits to synchronize simultaneous closure of the shore isolation valves (SIVs) with the shutdown ~~shut down~~ of loading pumps (N).

4~~6~~. A manual reset to restore the ESD system to an operational state after each initiation (N).

5~~7~~. An alarm to indicate failure of the primary power source (N).

6~~8~~. A secondary (emergency) power source (N).

7~~9~~. Periodic testing of the system (N/E).

8~~10~~. Fire proofing of motors and control-cables that are installed in areas classifies as Class I, Group D, Division 1 or 2 per the California Electrical Code [8.6]~~[8.7]~~. Fire proofing shall, at a minimum, comply with the recommendations ~~of API Publication 2218 (see~~ in Section 6 of API RP 2218 [8.7]~~[8.8])~~ (N).

Rationale: Based on public comment regarding Reference [8.6], the Commission staff revised these reference citations to consistently articulate the prevailing building standard. These amendments are sufficiently related and non-substantive.

8.15. ***3108F.6.3 Fire water.*** *… Water-based fire protection systems shall be tested and maintained per California NFPA 25 [8.9]~~[8.10]~~,…*

1. …

2. …

3. …

4. Hose connections for fireboats or tugboats shall be provided on the MOT fire water line, and at least one connection shall be an international shore fire connection at each berth [8.2]~~[8.4]~~. Connections shall be installed at a safe access distance from the ~~high-risk areas such as~~ sumps, manifolds and loading arms (N/E).

Rationale: Based on public comment regarding Reference [8.9], the Commission staff revised this reference citation to consistently articulate the prevailing building standard. This amendment is sufficiently related and non-substantive.

8.18. ***3108F.8 References.***

[8.1] American Petroleum Institute (API), 2012 ~~1998~~, API Recommended Practice 2001 (API RP 2001), "Fire Protection in Refineries," 9th ~~7th~~ ed., Washington, D.C.

[8.2] International Chamber of Shipping (ICS), Oil Companies International Marine Forum (OCIMF), International Association of Ports and Harbors (IAPH), 2006, "International Safety Guide for Oil Tankers and Terminals (ISGOTT)," 5th ed., Witherby, London.

~~[8.2] Oil Companies International Marine Forum (OCIMF), 1987, "Guide on Marine Terminal Fire Protection and Emergency Evacuation," 1st ed., Witherby, London.~~

[8.3] California Code of Regulations (CCR), Title 2, Division 3, Chapter 1, Article 5 – Marine Terminals Inspection and Monitoring (2 CCR 2300 et seq.) ~~2 CCR 2300-2407 (Title 2, California Code of Regulations, Sections 2300-2407).~~

~~[8.4] International Chamber of Shipping (ICS), Oil Companies International Marine Forum (OCIMF), International Association of Ports and Harbors (IAPH), 2006, "International Safety Guide for Oil Tankers and Terminals (ISGOTT)," 5th ed., Witherby, London.~~

[8.4~~5~~] American Petroleum Institute (API), 2008 ~~1998~~, API Recommended Practice 2003 (API RP 2003), "Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents," 7th ~~6th~~ ed., Washington, D.C.

[8.5~~6~~] Code of Federal Regulations (CFR), Title 33, Section 154.550 – Emergency Shutdown (33 CFR 154.550) ~~33 CFR 154.550 (Title 33, Code of Federal Regulations, Section 154.550).~~

[8.6~~7~~] California Code of Regulations (CCR), Title 24, Part 3, California Electrical Code ~~National Fire Protection Association (NFPA), 2013 2008, NFPA 70~~ (Article 500)~~,~~ ~~"National Electrical Code," 2014 ed., Quincy, MA~~.

[8.7~~8~~] American Petroleum Institute (API), 2013 ~~1999~~, API Recommended Practice ~~Publication~~ 2218 (API RP 2218), "Fireproofing Practices in Petroleum and Petrochemical Processing Plants," 3rd ~~2nd~~ ed., Washington, D.C.

[8.8~~9~~] National Fire Protection Association (NFPA)~~, 2012 2010~~, NFPA 72, "National Fire Alarm and Signaling Code,"~~ 2013 ed.,~~ Quincy, MA. For edition, see California Code of Regulations (CCR), Title 24, Part 2, Chapter 35 – Referenced Standards.

[8.9~~10~~] National Fire Protection Association (NFPA)~~, 2013 2011~~, California NFPA 25, "Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems," California ~~2014~~ ed.~~, Quincy, MA~~. For edition, see California Code of Regulations (CCR), Title 24, Part 2, Chapter 35 – Referenced Standards.

Authority: Sections 8750 through 8760 ~~8755 and 8757~~, Public Resources Code.

Reference: Sections 8750, 8751, 8755 and 8757, Public Resources Code.

Rationale: Based on public comment regarding proposed References [8.6], [8.8] and [8.9], the Commission staff revised these reference citations. Reference [8.6] is revised to consistently articulate the prevailing building standard. References [8.8] and [8.9] are revised to align with the prevailing building standards as cited in *Chapter 35 – Referenced Standards* of the California Building Standards Code. These amendments are sufficiently related and non-substantive.

Notation
Authority: Sections 8750 through 8760, Public Resources Code.
References: Sections 8750, 8751, 8755 and 8757, Public Resources Code.

DIVISION 9
SECTION 3109F
PIPING AND PIPELINES

9.6. *3109F.8~~7~~ References.*

[9.1] American Petroleum Institute (API), 2005, API Standard 2610 (R2010), "Design, Construction, Operation, Maintenance, and Inspection of Terminal and Tank Facilities," 2nd ed., Washington, D.C.

[9.2] American Society of Mechanical Engineers (ASME), 2015 ~~2010~~, ASME B31.3-2014 (ASME B31.3), "Process Piping," New York.

[9.3] American Society of Mechanical Engineers (ASME), 2012 ~~2009~~, ASME B31.4-2012 (ASME B31.4), "Pipeline Transportation Systems for ~~For~~ Liquid Hydrocarbons and ~~And~~ Other Liquids," New York.

[9.4] California Code of Regulations (CCR), Title 2, Division 3, Chapter 1, Article 5.5 – Marine Terminal Oil Pipelines (2 CCR 2560 et seq.) ~~2 CCR 2560 - 2571 (Title 2, California Code of Regulations (CCR), Sections 2560-2571).~~

[9.5] American Society of Mechanical Engineers (ASME), 2008, ASME B31E ~~B31.E~~, "Standard for the Seismic Design and Retrofit of Above-Ground Piping Systems," New York.

[9.6] …

[9.7] CalARP Program Seismic Guidance Committee, December 2013 ~~September 2009~~, "Guidance for California Accidental Release Prevention (CalARP) Program Seismic Assessments," Sacramento, CA.

[9.8] …

[9.9] American Petroleum Institute (API), 2009 ~~1997~~, API Standard 609, "Butterfly Valves: Double Flanged, Lug- and Wafer-Type," 7th ~~5th~~ ed., Washington, D.C.

[9.10] American Society of Mechanical Engineers (ASME), 2013 ~~1996~~, ASME B16.34-2013 (ASME B16.34), "Valves Flanged Threaded and ~~And~~ Welding End," New York.

[9.11] American Petroleum Institute (API), 2010 ~~1996~~, API Standard 607, "Fire Test for ~~Soft-Seated~~ Quarter-Turn Valves and Valves Equipped with Nonmetallic Seats," 6th ~~4th~~ ed.~~, 1993 (reaffirmed 4/1996)~~, Washington, D.C.

[9.12] American Petroleum Institute (API)~~, 2000~~, API Recommended Practice 520 P1 and P2 (API 520), "Sizing, Selection, and Installation of Pressure-relieving Devices, Part 1 ~~in Refineries, Part I~~ – Sizing and Selection," 2014, 9th ~~7th~~ ed., and "Sizing, Selection, and Installation of Pressure-Relieving Devices in Refineries – Part 2 ~~II~~ – Installation", 2015, 6th~~, 2003, 5th~~ ed., Washington, D.C.

[9.13] Code of Federal Regulations (CFR), Title 33, Section 154.2100 – Vapor Control System, General (33 CFR 154.2100) ~~33 CFR 154.808 – Vapor Control Systems, General (Title 33, Code of Federal Regulations (CFR), Section 154.808).~~

~~[9.14] American Petroleum Institute (API), 1991, Recommended Practice 1124 (API RP 1124), "Ship Barge, and Terminal Hydrocarbon Vapor Collection Manifolds," 1st ed., Washington, D.C.~~

[9.14] National Fire Protection Association (NFPA)~~, 2009~~, NFPA 11, "Standard for Low-, Medium-, and High-Expansion Foam," ~~2010 ed.,~~ Quincy, MA. For edition, see California Code of Regulations (CCR), Title 24, Part 2, Chapter 35 – Referenced Standards.

[9.15] National Fire Protection Association (NFPA)~~, 2012~~, NFPA 24, “Standard for the Installation of Private Fire Service Mains and Their Appurtenances,”~~ 2013 ed.,~~ Quincy, MA. For edition, see California Code of Regulations (CCR), Title 24, Part 2, Chapter 35 – Referenced Standards.

[9.16~~5~~] American Society of Mechanical Engineers (ASME), 2013~~ 1996~~, ASME B16.5-2013 (ASME B16.5), "Pipe Flanges and Flanged Fittings,” New York.

~~[9.16] American Petroleum Institute (API), 2009, API RP 574, “Inspection Practices for Piping System Components,” 3rd ed., Washington, D.C.~~

[9.17] American Society of Mechanical Engineers (ASME), 2007, ASME A13.1-2007 (R2013) (ASME A13.1), “Scheme for the Identification of Piping Systems,” New York.

Authority: Sections 8750 through 8760~~ 8755 and 8757~~, Public Resources Code.

Reference: Sections 8750, 8751, 8755 and 8757, Public Resources Code.

Rationale: Based on public comment regarding proposed References [9.14] and [9.15], the Commission staff revised these reference citations to align with the prevailing building standards as cited in *Chapter 35 – Referenced Standards* of the California Building Standards Code. These amendments are sufficiently related and non-substantive.

Notation
Authority: Sections 8750 through 8760, Public Resources Code.
References: Sections 8750, 8751, 8755 and 8757, Public Resources Code.

DIVISION 10
SECTION 3110F
MECHANICAL AND ELECTRICAL EQUIPMENT

10.3. ***3110F.2.2.2 Electrical components (N).*** *…*

1. *…Article 430 of the California Electrical Code ~~National Electrical Code (NEC)~~ [10.8]~~, [10.6]~~.*
2. *…Article 430 of the~~,~~ California Electrical Code ~~NEC~~ [10.8]~~[10.6]~~.*
3. *…Articles 500 and 501 of the California Electrical Code ~~NEC~~ [10.8]~~[10.6]~~… with Article 504 of the~~,~~ California Electrical Code ~~NEC~~ [10.8]~~[10.6]~~ and ~~ANSI/~~UL Std. No. 913 [10.9]~~[10.7]~~.*
4. *…Article 430 of the~~,~~ California Electrical Code ~~NEC~~ [10.8]~~[10.6]~~ and Section 3111F.*

Rationale: Based on public comment regarding Reference [10.8], the Commission staff revised these reference citations to consistently articulate the prevailing building standard. These amendments are sufficiently related and non-substantive.

10.5. ***3110F.3 Oil transfer hoses (N/E).*** *Hoses for oil transfer service shall be in compliance with 2 CCR 2380 ~~(a)~~ [10.4]~~[10.10]~~ and 33 CFR 154.500 ~~1 54.500~~ [10.11].*

Hoses with nominal diameters of 6 inches or larger shall have flanges that meet ASME B16.5 ~~ANSI B1 6.5~~ [10.12]~~. H~~, or hoses with nominal diameters of 6 inches ~~4 inches~~ or less may have quick disconnect fittings provided that they meet ASTM F 1122 [10.13] ~~F-1122 [10.13]~~.

The minimum hose length shall safely accommodate the vessel's size and maximum movements during transfer operations and mooring (see Section 3105F.2).

Rationale: Based on public comment, the proposed language is modified to articulate "*nominal*" diameter. This amendment is sufficiently related and non-substantive.

10.13. ***3110F.10 Pumps (N/E).*** *…*

… API Standard 2610 [10.22]~~[10.25]~~. …California NFPA 25 [10.27]~~[10.30]~~,…

Rationale: Based on public comment regarding Reference [10.27], the Commission staff revised this reference citation to consistently articulate the prevailing building standard. This amendment is sufficiently related and non-substantive.

10.14. ***3110F.12 References.***

[10.1] American Society of Mechanical Engineers (ASME), 2015, ASME B31.3-2014 (ASME B31.3), "Process Piping," New York.

~~[10.1] 2 CCR 2380(b), Title 2, California Code of Regulations, Section 2380(b), Loading Arms.~~

[10.2] Code of Federal Regulations (CFR), Title 33, Section 154.510 – Loading Arms (33 CFR 154.510) ~~33 CFR 154.510, Title 33 Code of Federal Regulations Section 154.510.~~

[10.3] Oil Companies International Marine Forum (OCIMF), 1999, "Design and Construction Specification for Marine Loading Arms," 3rd ed., Witherby, London.

[10.4] California Code of Regulations (CCR), Title 2, Division 3, Chapter 1, Article 5 – Marine Terminals Inspection and Monitoring (2 CCR 2300 et seq.)

[10.5] American Society of Civil Engineers (ASCE), 2014, ASCE/COPRI 61-14 (ASCE/COPRI 61), "Seismic Design of Piers and Wharves", Reston, VA.

[10.6~~4~~] American Society of Mechanical Engineers (ASME), 2013, ~~2000~~, ASME B40.100-2013 (ASME B40.100)~~1998~~, "Pressure Gauges and Gauge Attachments," New York.

[10.7~~5~~] National Fluid Power Association (NFPA), 2009, NFPA T3.6.7 R3-2009 (R2012) (NFPA T3.6.7 R3) ~~1996, ANSI/(NFPA) T3. 6. 7R2-1996~~, "Fluid Power Systems and Products – Square Head Industrial Cylinders - Mounting Dimensions," Milwaukee, WI.

[10.8~~6~~] California Code of Regulations (CCR), Title 24, Part 3, California Electrical Code. ~~National Fire Protection Association (NFPA), 2013 2002, NFPA 70, "National Electrical Code," 2014 ed., Quincy, MA.~~

[10.9~~7~~] Underwriters Laboratory, Inc., 2013 ~~1997~~, UL Standard No. 913, "Standard for Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, III, Division 1, Hazardous (Classified) Locations," ~~ANSI/UL Standard No. 913,~~ 8th ~~5th~~ ed., Northbrook, IL.

~~[10.8] 2 CCR 2370(e), Title 2 California Code of Regulations, Section 2370(e).~~

[10.10~~9~~] Code of Federal Regulations (CFR), Title 47, Part 15 – Radio Frequency Devices (47 CFR 15) ~~47 CFR Part 15 Private Land Mobile Radio Services, Title 47 Code of Federal Regulations (CFR).~~

~~[10.10] 2 CCR 2380(a), Title 2, California Code of Regulations, Section 2380(a).~~

[10.11] Code of Federal Regulations (CFR), Title 33, Section 154.500 – Hose Assemblies (33 CFR 154.500) ~~33 CFR 154.500 Hose Assemblies, Title 33 Code of Federal Regulations Section 154.500.~~

[10.12] American Society of Mechanical Engineers (ASME), 2013 ~~1996~~, ASME~~/ANSI~~ B16.5-2013 (ASME B16.5), "Pipe Flanges and Flanged Fittings," 13th ed., New York.

[10.13] American Society for Testing and Materials (ASTM), 2010, ASTM F1122-04(2010) (ASTM F1122) ~~2001, ASTMF-1122-87 (1998)~~, "Standard Specification for Quick Disconnect Couplings (6 in. NPS and Smaller)," 4th ed., West Conshohocken, PA.

~~[10.14] 29 CFR 1918, Subpart F, Title 29 Code of Federal Regulations Section 1918, Subpart F.~~

[10.14~~5~~] American Society of Mechanical Engineers (ASME), 2010 ~~1996~~, ASME B30.4-2010 (ASME B30.4) ~~–1996~~, "Portal Tower and Pedestal Cranes," 10th ed., New York.

[10.15~~6~~] American Society of Mechanical Engineers (ASME), 2011 ~~2002~~, ASME B30.7-2011 (ASME B30.7) ~~– 2001~~, "Winches ~~Base Mounted Drum Hoists~~," 11th ed., New York.

[10.16~~7~~] American Society of Mechanical Engineers (ASME), 1999, ASME HST-4-1999 (R2010) (ASME HST-4), "Performance Standard for Overhead Electric Wire Rope ~~Wire-Rope~~ Hoists," New York.

[10.17~~8~~] Code of Federal Regulations (CFR), Title 29, Section 1917.46 – Load Indicating Devices (29 CFR 1917.46) ~~29 CFR 1917.46, Title 29 Code of Federal Regulations Section 1917.46 Load Indicating Devices.~~

[10.18~~9~~] Code of Federal Regulations (CFR), Title 29, Section 1918.22 – Gangways (29 CFR 1918.22) ~~29 CFR 1918.22, Title 29 Code of Federal Regulations Section 1918.22, Gangways.~~

[10.19~~20~~] US Army Corps of Engineers (USACE), 2008 (05 Jul 11) ~~1996~~, EM 385-1-1, "Safety and Health Requirements Manual, Sections 19.B ~~(b)~~ and 21.E ~~(b)~~," ~~EM 385-1-1,~~ Washington, D.C.

[10.20~~1~~] International Chamber of Shipping (ICS), Oil Companies International Marine Forum (OCIMF), International Association of Ports and Harbors (IAPH), 2010, ~~Chapter 16.4, Ship/Shore Access,~~ "International Safety Guide for Oil Tankers and Terminals (ISGOTT)", 5th ed. ~~2006~~, Witherby, London.

~~[10.22] 2 CCR 2380 (f), Title 2, California Code of Regulations, Section 2380(f), Small Discharge Containment.~~

~~[10.23] 33 CFR 154.530, Title 33, Code of Federal Regulations, Section 154.530 Small Discharge Containment.~~

[10.21~~4~~] Code of Federal Regulations (CFR), Title 33, Sections 154.2000 through 154.2250 – Vapor Control Systems (33 CFR 154.2000 et. seq.) ~~33CFR154.800 through 154.850, Title 33 Code of Federal Regulations, Sections 154.800 through 154.850.~~

[10.22~~5~~] American Petroleum Institute (API), 2005, API Standard 2610 (R2010), "Design, Construction, Operation, Maintenance, and Inspection of Terminal and Tank Facilities," 2nd ed., Washington, D.C.

[10.23~~6~~] Federal Emergency Management Agency, 2003, FEMA 450, "NEHRP Recommended Provisions for Seismic Regulations for New Buildings and Other Structures ~~(FEMA 450)~~," ~~Part 1 — Provisions,~~ Washington, D.C.

[10.24~~7~~] CalARP Program Seismic Guidance Committee, December 2013 ~~September 2009~~, "Guidance for California Accidental Release Prevention (CalARP) Program Seismic Assessments," Sacramento, CA.

[10.25~~8~~] Federal Emergency Management Agency (FEMA), Nov. 2000, FEMA 356, "Prestandard and Commentary for the Seismic Rehabilitation of Buildings," Washington, D.C.

[10.26~~9~~] American Society of Civil Engineers (ASCE), 2011 ~~1997~~, "Guidelines for Seismic Evaluation and Design of Petrochemical Facilities," 2nd ed., New York~~, NY~~.

[10.27~~30~~] National Fire Protection Association (NFPA)~~, 2013 2011~~, California NFPA 25, "Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems," California ~~2014~~ ed.~~, Quincy, MA~~. For edition, see California Code of Regulations (CCR), Title 24, Part 2, Chapter 35 – Referenced Standards.

Authority: Sections 8750 through 8760 ~~8755 and 8757~~, Public Resources Code.

Reference: Sections 8750, 8751, 8755 and 8757, Public Resources Code.

Rationale: Based on public comment regarding proposed References [10.8] and [10.27], the Commission staff revised these reference citations. Reference [10.8] is revised to consistently articulate the prevailing building standards. Reference [10.27] is revised to align with the prevailing building standard as cited in *Chapter 35 – Referenced Standards* of the California Building Standards Code. These amendments are sufficiently related and non-substantive.

Notation
Authority: Sections 8750 through 8760, Public Resources Code.
References: Sections 8750, 8751, 8755 and 8757, Public Resources Code.

DIVISION 11
SECTION 3111F
ELECTRICAL SYSTEMS

11.1. ***3111F.1 General.*** *This section provides minimum standards for electrical systems at marine oil terminals.*

Electrical systems include the incoming electrical service and components, the electrical distribution system, branch circuit cables and the connections, including, but not limited to:~~. Also included are:~~

…

All electrical systems shall conform to API RP 540 [11.1] and the California ~~National~~ Electrical Code ~~(NEC)~~ [11.2].

…

Rationale: Based on public comment regarding Reference [11.2], the Commission staff revised this reference citation to consistently articulate the prevailing building standard. This amendment is sufficiently related and non-substantive.

11.2. ***3111F.2 Hazardous area designations and plans (N/E).*** *Area classifications shall be determined in accordance with API RP 500 [11.3], API RP 540 [11.1] and ~~the NEC,~~ Articles 500, 501, 504, 505 and 515 of the California Electrical Code ~~NEC~~ [11.2]. A marine oil terminal shall have a current set of scaled plan drawings, with clearly designated areas showing the hazard class, division and group. The plan view shall be supplemented with sections, elevations and details to clearly delineate the area classification at all elevations starting from low water level. The drawings shall be certified by a professional ~~aprofessional~~ electrical engineer. The plans shall be reviewed, and revised when modifications to* the structure, product or equipment change hazardous area identifications or boundaries.

Rationale: Based on public comment regarding Reference [11.2], the Commission staff revised this reference citation to consistently articulate the prevailing building standard. This amendment is sufficiently related and non-substantive.

11.2a. ***3111F.3 Identification and tagging.*** *All electrical equipment, cables and conductors shall be clearly identified by means of tags, plates, color coding or other effective means to facilitate troubleshooting and improve safety, and shall conform to the identification carried out for the adjacent on-shore facilities (N). Topics for such identification are found in the ~~NEC~~ Articles 110, 200, 210, 230, 384, 480 and 504 of the California Electrical Code [11.2]. Existing electrical equipment (E) shall be tagged.*

…

Rationale: Based on public comment regarding Reference [11.2], the Commission staff added this Express Term and revised this reference citation to consistently articulate the prevailing building standard. This amendment is sufficiently related and non-substantive.

11.4. ***3111F.5 Electrical service.*** *Where critical circuits are used for spill prevention, fire control or life safety, an alternative service derived from a separate source and conduit system, shall be located at a safe distance from the main power service. A separate feeder from a double-ended substation or other source backed up by emergency generators will meet this requirement. A~~n~~ stored energy emergency ~~uninterrupted~~ power system ~~service (UPS)~~ (SEEPS) shall be provided for control and supervisory circuits associated with ESD systems (N), see Section 3111F.5.1.*

1. *…*
2. *Wiring in fireproofed conduits shall be derated 15 percent to account for heat buildup during normal operation. Type MI (mineral insulated, metal sheathed per the California Electrical Code [11.2]) cables may be used in lieu of fireproofing of wiring (N).*
3. *…*
4. *…*

…

Rationale: Based on public comment regarding Reference [11.2], the Commission staff revised this reference citation to consistently articulate the prevailing building standard. This amendment is sufficiently related and non-substantive.

11.6. ***3111F.6 Grounding and bonding (N/E).***

1. *All electrical equipment shall be effectively grounded as per ~~NEC~~ Article 250 of the California Electrical Code [11.2]. …*
2. *…*
3. *Bonding of vessels to the MOT structure is not permitted (2 CCR 2341 ~~(f)~~) [11.7] ~~[11.5]~~.*
4. *…*
5. *…*

Rationale: Based on public comment regarding Reference [11.2], the Commission staff revised this reference citation to consistently articulate the prevailing building standard. This amendment is sufficiently related and non-substantive.

11.13. ***3111F.12 References.***

[11.1] American Petroleum Institute (API), 1999, API Recommended Practice 540 (R2004) (API RP 540), "Electrical Installations in Petroleum Processing Plants," 4th ed., Washington, D.C.

[11.2] California Code of Regulations (CCR), Title 24, Part 3, California Electrical Code. ~~National Fire Protection Association (NFPA), 2013 2002, NFPA 70, "National Electrical Code (NEC)," 2014 ed., Quincy, MA.~~

[11.3] American Petroleum Institute (API), 2012 (Errata January 2014) ~~1997~~, API Recommended Practice 500 (API RP 500), "Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Division 1 and Division 2," 3rd ~~2nd~~ ed., Washington, D.C.

[11.4] National Fire Protection Association (NFPA), 2012 ~~1998~~, NFPA 496, "Standard for Purged and Pressurized Enclosures for Electrical Equipment," 2013 ed., Quincy, MA.

~~[11.5] 2 CCR 2341(f), Title 2, California Code of regulations, Section 2341(f).~~

[11.5~~6~~] National Fire Protection Association (NFPA)~~, 2012 2010~~, NFPA 110, "Standard for Emergency and Standby Power Systems,"~~ 2013 ed.,~~ Quincy, MA. For edition, see California Code of Regulations (CCR), Title 24, Part 2, Chapter 35 – Referenced Standards.

[11.6~~7~~] National Fire Protection Association (NFPA)~~, 2012 2011~~, NFPA 111, "Standard on Stored Electrical Energy Emergency and Standby Power Systems,"~~ 2013 ed.,~~ Quincy, MA. For edition, see California Code of Regulations (CCR), Title 24, Part 2, Chapter 35 – Referenced Standards.

[11.7] California Code of Regulations (CCR), Title 2, Division 3, Chapter 1, Article 5 – Marine Terminals Inspection and Monitoring (2 CCR 2300 et seq.)

~~[11.8] 2 CCR 2365, Title 2 California Code of Regulations, Section 2365.~~

[11.8~~9~~] Code of Federal Regulations (CFR), Title 33, Section 154.570 – Lighting (33 CFR 154.570) ~~33 CFR 154.570(d), Title 33 Code of Federal Regulations Section 154.570(d).~~

~~[11.10] 2 CCR 2370, Title 2 California Code of Regulations, Section 2370.~~

[11.9~~11~~] Oil Companies International Marine Forum (OCIMF), 1987, "Guide on Marine Terminal Fire Protection and Emergency Evacuation," 1st ed., Witherby, London.

[11.10~~2~~] American Petroleum Institute (API), 2012, API Standard 2350 ~~1996, API Recommended Practice 2350 (API RP 2350)~~, "Overfill Protection for Storage Tanks in Petroleum Facilities," 4th ~~2nd~~ ed., Washington, D.C.

[11.11~~3~~] Code of Federal Regulations (CFR), Title 33, Section 154.2102 – Facility Requirements for Vessel Liquid Overfill Protection (33 CFR 154.2102) ~~33 CFR 1 54.812, Title 33, Code of Federal Regulations, Section 154.812 - Facility Requirements for Vessel Liquid Overfill Protection.~~

~~[11.14] National Association of Corrosion Engineers (NACE), Standard Recommended Practice, 1994, RP01 76-1994 "Corrosion Control of Steel Fixed Offshore Platforms Associated with Petroleum Production," Houston, TX.~~

[11.12~~5~~] United Facilities Criteria (UFC), 2004 January 16, UFC 3-570-02N, "Electrical Engineering Cathodic Protection", ~~Department of Defense, 31 January 1990, Military Handbook, "Electrical Engineering Cathodic Protection," MIL-HDBK-1004/10,~~ Washington, D.C.

[11.13~~6~~] American Petroleum Institute (API), 2009 ~~2002~~, API 570, "Piping Inspection Code: In-service Inspection, Repair, and Alteration of Piping Systems," 3rd ~~2nd~~ ed., ~~October 1998 (February 2000 Addendum 1),~~ Washington, D.C.

~~[11.17] 2 CCR 2341(d) and 2380, Title 2, California Code of Regulations, Sections 2341(d) and 2380.~~

Authority: Sections 8750 through 8760 ~~8755 and 8757~~, Public Resources Code.

Reference: Sections 8750, 8751, 8755 and 8757, Public Resources Code.

Rationale: Based on public comment regarding proposed References [11.2], [11.5] and [11.6], the Commission staff revised these reference citations. Reference [11.2] is revised to consistently articulate the prevailing building standard. References [11.5] and [11.6] are revised to align with the prevailing building standards as cited in *Chapter 35 – Referenced Standards* of the California Building Standards Code. These amendments are sufficiently related and non-substantive.

Notation
Authority: Sections 8750 through 8760, Public Resources Code.
References: Sections 8750, 8751, 8755 and 8757, Public Resources Code.